

ART 34 AMDT

Claims

1. A pump-action nozzle device adapted to be fitted to a container and to enable fluid stored in the interior of said container to be dispensed during use, said device having a body which defines:
- 5 (i) an internal chamber;
- (ii) an outlet through which fluid dispensed from said chamber is ejected from the device, said outlet further comprising an outlet valve configured to only open and permit fluid to be dispensed from the chamber when the pressure therein exceeds a predetermined minimum threshold pressure; and
- 10 (iii) an inlet through which fluid can be drawn into said chamber, said inlet further comprising a valve configured to only open and permit fluid to be drawn into the chamber when the pressure within the chamber falls below the external pressure;
- 15 said body comprising a base portion and a housing portion, said base portion and housing portions together defining the internal chamber of the device and being slidably mounted to one another such that said housing portion can be slid towards the base portion to reduce the internal volume of the chamber during a first stage of operation, thereby causing the pressure within
- 20 the chamber to increase and any fluid stored therein to be dispensed through said outlet if the pressure therein exceeds the predetermined minimum

threshold pressure required to open the outlet valve, and then slid away from the base to increase the volume of the chamber during a second stage of operation, thereby causing the pressure within the chamber to reduce and fluid to be drawn into the chamber through the inlet;

5 wherein fluid present within said internal chamber is contained within a resiliently deformable insert, which is resiliently biased to urge said housing and said base apart and is configured to be compressed when the volume of the chamber is reduced by sliding the housing towards the base.

2. A pump-action nozzle device adapted to be fitted to a container and to
10 enable fluid stored in the interior of said container to be dispensed during use,
said device having a body which defines:

- (i) an internal chamber;
- (ii) an outlet through which fluid dispensed from said chamber is ejected from the device, said outlet further comprising an outlet valve configured to only open and permit fluid to be dispensed from the chamber when the pressure therein exceeds a predetermined minimum threshold pressure; and
- (iii) an inlet through which fluid can be drawn into said chamber, said inlet further comprising a valve configured to only open and permit fluid to be drawn into the chamber when the pressure within the chamber falls below the external pressure,

PART 2: PART II

said body comprising a base portion and a housing portion, said base portion and housing portions together defining the internal chamber of the device and being slidably mounted to one another such that said housing portion can be slid towards the base portion to reduce the internal volume of the
5 chamber during a first stage of operation, thereby causing the pressure within the chamber to increase and any fluid stored therein to be dispensed through said outlet if the pressure therein exceeds the predetermined minimum threshold pressure required to open the outlet valve, and then slid away from the base to increase the volume of the chamber during a second stage of
10 operation, thereby causing the pressure within the chamber to reduce and fluid to be drawn into the chamber through the inlet;

wherein said device is adapted to generate a spray of the fluid dispensed.

3. A pump-action nozzle device according to claim 1 or claim 2, wherein the base is configured to be fitted to a container.
15 4. A pump-action nozzle device according to any one of claims 1 to 3, wherein the base defines the inlet.
5. A pump-action nozzle device according to any one of the preceding claims, wherein an under surface of the base is configured to be fitted to a container and the upper surface of the base forms an internal surface of the
20 chamber.

6. A pump-action nozzle device according to any one of the preceding claims, wherein the housing forms one or more internal walls of the chamber
7. A pump-action nozzle device according to claims 5 or 6, wherein the housing defines the side wall and an end wall of the chamber and the base
5 defines the opposing end wall.
8. A pump-action nozzle device according to any one of claims 5 to 7, wherein the housing is slidably mounted within a recess formed in an upper surface of the base.
9. A pump-action nozzle device according to claim 2, or any one of claims
10 3 to 8 when dependent on claim 2, wherein the internal chamber further comprises a plunger.
10. A pump-action nozzle device according to claim 9, wherein the plunger remains stationery while the housing is moved relative to the base.
11. A pump-action nozzle device according to claim 9 or claim 10, wherein
15 the plunger forms two seals with the side walls of the chamber, a first of said seals being configured to prevent fluid leaking past the plunger during the first stage of operation and a second of said seals being configured to prevent air leaking into the being drawn into the chamber during the second stage of operation of the device.
- 20 12. A pump-action nozzle device according to any one of claims 9 to 11, wherein the plunger is seated on the base.

13. A pump-action nozzle device according to claim 12, wherein the plunger additionally comprises a valve member which is received by a valve seat formed by the base to form said inlet valve.

14. A pump-action nozzle device according to claim 2, or any one of claims 5 3 to 13 when dependent on claim 2, wherein said nozzle arrangement comprises a resilient means which is resiliently biased to urge said base and said housing apart.

15. A pump-action nozzle device according to claim 14, wherein said resilient means is a spring disposed within the chamber.

10 16. A pump-action nozzle device according to claim 2, or any one of claims 3 to 8 when dependent on claim 2, wherein fluid present within said internal chamber is contained within a resiliently deformable insert, which is resiliently biased to urge said housing and said base apart and is configured to be compressed when the volume of the chamber is reduced by sliding the housing 15 towards the base.

17. A pump-action nozzle device according to any one of the preceding claims, wherein cooperating detents provided on the base and the housing abut one another to limit the extent by which the housing may move away from the base.

18. A pump-action nozzle device according to any one of the preceding claims, wherein the outlet comprises an outlet orifice and an internal passageway which connects said chamber to said outlet orifice.
19. A pump-action nozzle device according to claim 18, wherein said outlet valve defined by the body and is disposed within said internal passageway.
20. A pump action nozzle device according to claim 18 or claim 19, wherein at least a portion of the internal passageway is defined between the abutment surfaces of two or more component parts of the body of the nozzle device.
21. A pump action nozzle device according to claim 20, wherein a portion of the internal passageway is also defined by just one of said component parts.
22. A pump action nozzle device according to claim 21, wherein said outlet valve is formed on said part and disposed within said portion.
23. A pump action nozzle device according to any one of claims 19 to 21, wherein the valve is disposed in the at least a portion of the internal passageway that is defined between the abutment surfaces of the two or more component parts of the body.
24. A pump action nozzle device according to claim 23, wherein a valve member of the outlet valve is formed on one of said parts, said valve member being resiliently biased to assume a position in which the internal passageway is closed and being further configured to only be displaced from said resiliently biased position to define an open channel through which fluid can flow when

the pressure within the chamber exceeds a predetermined minimum threshold pressure.

25. A pump action nozzle device according to any one of claims 20 to 24, wherein each of said parts has an abutment surface which contacts the abutment surfaces of the other parts when the parts are contacted together in the assembled nozzle device, at least one of said abutment surfaces having one or more groove and/or recesses formed thereon which define said internal passageway between the abutment surfaces when said parts are contacted together.
- 10 26. A pump action nozzle device according to any one of the preceding claims, wherein said outlet is defined by the housing portion of the body.
27. A pump-action nozzle device according to any one of the preceding claims, wherein said housing further comprises two component parts.
- 15 28. A pump-action nozzle device according to claim 27 when dependent on claim 18, wherein at least a portion of said passageway is defined between two component parts of the housing portion of said body.
29. A pump action nozzle device according to claim 27 or claim 28, both when dependent on claim 18, wherein said housing comprises a first component part that defines said chamber together with said base and a second component part which is fitted to said first part to such that abutment surfaces of said first and second parts are contacted together to define at least a portion of the internal passageway.

30. A pump action nozzle device according to any one of claims 18 to 25 and 28 to 29, wherein the outlet orifice is formed at an edge of the abutment surfaces of the two or more component parts.
31. A pump action nozzle device according to any one of claims 18 to 25 and 28 to 30, wherein the device is adapted to generate a spray of the fluid dispensed.
32. A pump action nozzle device according to claim 31, wherein said internal passageway further comprises one or more internal spray-modifying features prior to a final spray orifice or swirl chamber and orifice.
33. A pump action nozzle device according to any one of claims 1 to 31, wherein said nozzle arrangement is adapted to generate a spray of the fluid dispensed and is configured to receive an insert comprising one or more spray modifying features, said insert being configured such that fluid exiting the outlet orifice flows into said insert, through the one or more spray modifying features, and is ejected through an outlet of the insert.
34. A pump action nozzle device according to claims 32 or 33, wherein said spray-modifying features include one or more features selected from the group consisting of: an expansion chamber, a swirl chamber, an internal orifice, multiple passageway branches, a dog-leg arrangement, a venturi chamber, an outlet orifice in the form of a slit, or multiple outlet orifices.
35. A pump action nozzle device according to any one of the preceding claims, wherein said device further comprises an air leak valve configured to

enable air from the external environment to access the interior of the container to equalise any pressure differential that exists between them.

36. A pump action nozzle device according to any one of the preceding claims, wherein said chamber is divided into two compartments, a first of said 5 compartments comprising the inlet valve and the outlet valve and being configured dispense fluid drawn in through the inlet of the device during the first and second stages of operation, and a second of said compartments being a separate an air compartment configured to a eject a stream of air through the nozzle outlet during the first stage of operation and draw air in from the outside 10 during a second stage of operation.

37. A pump action nozzle device according to claim 36, wherein said air chamber is provided with an outlet valve configured to only open and permit a stream air to flow through the outlet of the nozzle arrangement when the pressure within the air compartment exceeds a predetermined minimum 15 pressure.

38. A pump action nozzle device according to any one of claims 18 to 25 in combination with claim 36 or claim 37, wherein said air stream is introduced into said internal passageway at any position along its length through an outlet channel of the air compartment.

20 39. A pump action nozzle device according to any one of claims 36 to 38, wherein said air compartment further comprises an air inlet valve.

40. A pump action nozzle device according to any one of the preceding claims, wherein said device further comprises a trigger actuator configured such that when said trigger is pulled, said housing is caused to slide towards said base in said first stage of operation.

5 41. A trigger actuator adapted to be fitted to a pump-action nozzle device as defined in any one of claims 1 to 40, said trigger actuator comprising a trigger and means by which the trigger actuator may be connected to the base and the housing, wherein said trigger actuator is configured so that when the trigger is pulled said housing is caused to move relative to the base and compress the 10 chamber during the first stage of operation and when said trigger is released said housing can move relative to the base to expand the chamber during the first stage of operation.

42. A trigger actuator according to claim 41, wherein said trigger actuator is connected to the base of the nozzle device by a first attachment element and the 15 housing by a second attachment element, said elements being moveable towards each other when the trigger is pulled and moveable apart from each other when the trigger is returned to its original position.

43. A pump action nozzle device adapted to be fitted to an opening of a container and enable a liquid to be dispensed from the interior of said container, 20 said nozzle device having a body which defines an internal chamber and which comprises:

- (i) an inlet having a one-way valve through which fluid can be drawn into said chamber;
- (ii) an outlet orifice;
- (iii) an internal passageway that connects said chamber to said outlet orifice;
- (iv) a one-way outlet valve disposed in said internal passageway and adapted to only open and permit fluid to flow along said passageway when the pressure within the internal chamber exceeds a predetermined minimum pressure; and
- (v) an actuator;
- said body being configured such that the internal volume of the chamber is reduced when said actuator is operated, thereby causing fluid stored in the chamber to be ejected through said outlet valve and along said internal passageway to the outlet orifice, and increased when said actuator is released, thereby causing fluid to be drawn into the chamber through the inlet;
- the body further defines an air chamber configured to dispense a stream of air into said internal passageway or said outlet orifice when said actuator is operated through an outlet channel which connects said air chamber to a position along said internal passageway or said outlet, said body being configured such that the internal volume of the air chamber is reduced when said actuator is operated, thereby causing air present in the air chamber to be ejected through said outlet channel and into said internal passageway or said

ART 34 AMEND

outlet orifice, and increased when said actuator is released, thereby causing air to be drawn into the air chamber;

characterised in that one of the chamber and the air chamber at least partially surrounds the other of the chamber and the air chamber.

5 44. A pump action nozzle device adapted to be fitted to an opening of a container and enable a liquid to be dispensed from the interior of said container, said nozzle device having a body which defines an internal chamber and which comprises:

(i) an inlet having a one-way valve through which fluid can be drawn
10 into said chamber;

(ii) an outlet orifice;

(iii) an internal passageway that connects said chamber to said outlet orifice;

(iv) a one-way outlet valve disposed in said internal passageway and
15 adapted to only open and permit fluid to flow along said passageway when the pressure within the internal chamber exceeds a predetermined minimum pressure; and

(v) an actuator;

said body being configured such that the internal volume of the chamber
20 is reduced when said actuator is operated, thereby causing fluid stored in the chamber to be ejected through said outlet valve and along said internal

ATT 3A AMENDT

passageway to the outlet orifice, and increased when said actuator is released, thereby causing fluid to be drawn into the chamber through the inlet;

the body further defines an air chamber configured to dispense a stream of air into said internal passageway or said outlet orifice when said actuator is operated through an outlet channel which connects said air chamber to a position along said internal passageway or said outlet, said body being configured such that the internal volume of the chamber is reduced when said actuator is operated, thereby causing air present in the air chamber to be ejected through said outlet channel and into said internal passageway or said outlet orifice, and increased when said actuator is released, thereby causing air to be drawn into the air chamber;

characterised in that fluid present within said internal chamber is contained within a resiliently deformable insert, which is resiliently biased to urge said housing and said base apart and is configured to be compressed when the volume of the chamber is reduced by sliding the housing towards the base.

45. A pump-action nozzle device according to claim 44, wherein the air present within said air chamber is contained within a resiliently deformable insert, which is resiliently biased to urge said housing and said base apart and is configured to be compressed when the volume of the chamber is reduced by sliding the housing towards the base.

46. A pump action nozzle device adapted to be fitted to an opening of a container and enable a liquid to be dispensed from the interior of said container,

ART 2A AMDT

said nozzle device having a body which defines an internal chamber and which comprises:

- (i) an inlet having a one-way valve through which fluid can be drawn into said chamber;
- 5 (ii) an outlet orifice;
- (iii) an internal passageway that connects said chamber to said outlet orifice;
- (iv) a one-way outlet valve disposed in said internal passageway and adapted to only open and permit fluid to flow along said passageway when the pressure within the internal chamber exceeds a predetermined minimum pressure; and
- 10 (v) an actuator;

said body being configured such that the internal volume of the chamber is reduced when said actuator is operated, thereby causing fluid stored in the chamber to be ejected through said outlet valve and along said internal passageway to the outlet orifice, and increased when said actuator is released, thereby causing fluid to be drawn into the chamber through the inlet;

the body further defines an air chamber configured to dispense a stream of air into said internal passageway or said outlet orifice when said actuator is operated through an outlet channel which connects said air chamber to a position along said internal passageway or said outlet, said body being configured such that the internal volume of the chamber is reduced when said

ART 3A AMENDT

actuator is operated, thereby causing air present in the air chamber to be ejected through said outlet channel and into said internal passageway or said outlet orifice, and increased when said actuator is released, thereby causing air to be drawn into the air chamber;

5 characterised in that the device is adapted to dispense a bolus of liquid from the outlet orifice.

47. A pump-action nozzle device according to any one of claims 43 to 46, wherein the device comprises a resilient means configured to cause the volume of the chamber to increase once the actuator is released.

10 48. A pump-action nozzle device according to any one of claims 43 to 47, wherein the body of the device comprises two component parts that can be moved towards one another to compress both the internal chamber and the air chamber and away from one another to cause both the internal chamber and the air chamber to expand.

15 49. A pump-action nozzle device according to claim 48 when dependent on claim 47, wherein the resilient means is biased against both of said parts to urge the two parts away from one another and said chamber is compressed by applying a pressure against the action of said resilient means.

20 50. A pump-action nozzle device according to claim 49, wherein the resilient means is a spring or a resiliently deformable insert provided in one or both said internal chamber and said air chamber.

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51. A pump-action nozzle device according to any one or claims 43 to 50, wherein air is drawn into the air chamber through the outlet orifice, internal passageway and outlet channel when the actuator is released and the volume of said chamber is caused to increase/expand.

5 52. A pump-action nozzle device according to any one of claims 43 to 50, wherein the device further comprises an air inlet through which air is drawn into the air chamber from outside the device.

53. A pump-action nozzle device according to claim 52, wherein the air inlet comprises an air inlet valve configured to only open and permit air to be drawn 10 into the air chamber when the pressure therein falls below the external pressure.

54. A pump-action nozzle device according to any one of claims 43 to 53, wherein air is introduced into the internal passageway at a position which is downstream from the outlet valve.

55. A pump-action nozzle device according to any one of claims 43 to 54, 15 wherein the outlet channel is one or more fine holes or pores which permit air to flow through but prevent liquid from the internal chamber accessing the air chamber.

56. A pump-action nozzle device according to any one of claims 43 to 54, wherein the outlet channel comprises an air release valve adapted to only open 20 and permit fluid to flow along said passageway when the pressure within the air chamber exceeds a predetermined minimum threshold pressure.

AFT 22 AUG 07

57. A pump-action nozzle device according to claim 51 in combination with claim 56, wherein the air release valve is a two-way valve configured to permit air to flow (i) out of the air chamber when the pressure within the chamber exceeds a predetermined minimum pressure, and (ii) into the air chamber when 5 the pressure therein is below the external pressure.
58. A pump-action nozzle device according to claim 56, wherein the air release valve is a one way valve configured to only open and permit air to flow out of the air chamber when the pressure therein exceeds a predetermined minimum and prevent flow in the opposite direction.
- 10 59. A pump-action nozzle device according to any one of claims 56 to 58, wherein the outlet valve and the air release valve are configured to open at substantially the same minimum threshold pressure.
60. A pump-action nozzle device according to any one of claims 43 to 59, wherein the internal passageway is separated from said air chamber by a wall of 15 the body and said outlet channel is formed in said wall at any desired position so that air can be ejected into said internal passageway to any desired position along the length of the internal passageway.
61. A pump-action nozzle device according to claim 60, wherein the chamber is positioned either above or below the internal passageway and said 20 outlet channel is formed in an upper or lower wall of the chamber respectively.

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62 A pump-action nozzle device according to any one of claims 43 to 61 wherein at least a portion of the internal passageway of the outlet is defined between the abutment surfaces of two or more component parts of the nozzle device.

5 63. A pump-action nozzle device according to claim 62, wherein a portion of the internal passageway may be defined by just one of said component parts.

64. A pump-action nozzle device according to claim 62 or claim 63, wherein each of said parts has an abutment surface which contacts the abutment surfaces of the other parts when the respective component parts are contacted
10 together in the assembled nozzle device and at least one of said abutment surfaces has one or more groove and/or recesses formed thereon which define said internal passageway between the abutment surfaces when said parts are contacted together.

65. A pump-action nozzle device according to claim 64, wherein the at least
15 a portion of the internal passageway is defined between two component parts of said body.

66. A pump-action nozzle device according to claim 65, wherein the at least a portion of the passageway is defined between opposing abutment surfaces of said two parts and at least one of said abutment surfaces having one or more
20 grooves and/or recesses formed thereon which define said passageway when the abutment surfaces of said parts are contacted together.

67. A pump-action nozzle device according to any one of claims 43 to 66, wherein the outlet valve is formed by the body of the nozzle arrangement.
68. A pump-action nozzle device according to claim 67, wherein at least a portion of the internal passageway is defined between the abutment surfaces of
5 two or more parts of the nozzle device and the outlet valve is formed within said portion of the internal passageway.
69. A pump-action nozzle device according to claim 68, wherein the outlet valve comprises a valve member that is formed on one of the component parts, said valve member being resiliently biased against the opposing surface of the
10 other component part or parts, thereby closing the internal passageway formed there between, and being configured to be displaced so as to define an open channel through which fluid can flow when the pressure within the chamber exceeds a predetermined minimum threshold pressure.
70. A pump action nozzle device according to any one of claims 43 to 45, or
15 any one of claims 47 to 69 when dependent on any one of claims 43 to 45, wherein said internal passageway further comprises one or more internal spray-modifying features prior to a final spray orifice or swirl chamber and orifice.
71. A pump action nozzle device according to any one of claims 43 to 45, or
any one of claims 47 to 69 when dependent on any one of claims 43 to 45,
20 wherein said nozzle arrangement is configured to receive an insert comprising one or more spray modifying features, said insert being configured such that

fluid exiting the outlet orifice flows into said insert, through the one or more spray modifying features, and is ejected through an outlet of the insert.

72. A pump action nozzle device according to claims 70 or 71, wherein said spray-modifying features include one or more features selected from the group consisting of: an expansion chamber, a swirl chamber, an internal orifice, multiple passageway branches, a dog-leg arrangement, a venturi chamber, an outlet orifice in the form of a slit, or multiple outlet orifices.

73. A pump action nozzle device according to any one of claims 70 to 72, wherein said outlet channel is arranged so that air from the air chamber is introduced into a chamber formed in the internal passageway.

74. A pump action nozzle device according to any one of claims 43 to 73, wherein said device further comprises an air leak valve configured to enable air from the external environment to access the interior of the container to equalise any pressure differential that exists between them.

15 75. A pump-action nozzle device according to any preceding claim, wherein at least one component of the device is formed by a bi-injection moulding process.

76. A pump-action nozzle device according to claim 75, wherein said at least one component is formed from two different materials using said bi-injection moulding process.

77. A container comprising a pump-action nozzle arrangement as defined in any one of claims 1 to 42 fitted thereto.
78. A container comprising a pump-action nozzle arrangement as defined in any one of claims 42 to 76 fitted thereto.